Egypt. Poult. Sci. Vol (29) (I): (385-405)

EFFECT OF INDUCED MOLTING ON SOME PRODUCTIVE AND PHYSIOLOGICAL TRAITS IN HY-LINE HENS

El-Gendi, G. M.*; H. R. Samak, ** and A. A. Mohamed, *

By

* Department of Animal Production, Faculty of Agriculture, Benha Univ.

** Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Giza, Egypt.

Received: **03/02/2009** Accepted:**22/3/2009**

Abstract: *The present study aimed to investigate the effect of different molting procedures on the post molt performance and some physiological traits. Two hundred and seventy Hy-Line laying hens aged 60 weeks were randomly chosen from a large commercial flock. All hens were approximately of an equal body weight and similar performance.*

Birds were divided into three groups. Birds of the first group (30 birds) were fed ad-libitum and considered as control. The second group (120 birds) was force molted by adding 1% zinc oxide on diet for 14 days. While birds of the third group (120 birds) were force molted by feed restriction (25%) for 7 days then fasting fore subsequent 7 days.

At the end of the force molting treatments (14 days) when hens completely ceased egg production, the 2nd and 3rd groups were equally divided into 4 subgroups each (30 birds each) and injected as follows:-1- Distilled water (1 ml) for 6 days. 2- Estradiol 17 β(10 mg/ml) for 6 days. 3- Indomethacin (10 mg/ml) for 3 days then Bromocriptine (10 mg/ml) for 3 days. 4- Human Chorionic Gonadotrophin (HCG) 50 IU for 6 days.

Results indicated that: All force molting treatments, applied caused significant decrease in live body weight. Force molted hens fed 1 % zinc and injected with estradiol had the highest average of body weight after molting followed by non-molted hens then by those of fast molted hens injected with indomethacin and promocreptine. Fast molted hens injected with estradiol had significantly the lower average of feed consumption at all experimental intervals and significantly improved feed conversion compared with all treatments applied. Hens fed 1 % zinc and injected with either HCG or estradiol 17 β had the highest grand mean average of egg production. Fast molted hens injected with HCG had the highest averages

of egg weight and egg mass. Plasma estradiol level was higher in fast molted hens injected with HCG and their corresponding zinc at 4th and 8th weeks after molting, respectively. Force molted hens by zinc and injected with distilled water had significantly the highest levels of plasma progesterone. Appling fasting as a method of force molting significantly decreased plasma T_3 and increased plasma T_4 level.

From this study, it could be recommended to use fasting to force laying hens to rest and injected with either estradiol or HCG, respectively to improve productivity of laying hens during the second laying cycle.

INTRODUCTION

Molting is a major event in the annual life cycle of most avian species, both wild and domestic. In the commercial egg industry, widely different molt techniques are used before the end of the first laying to force hens, and enter to a second egg laying cycle (**North and Bell, 1999**) for extending laying flock performance. Most researchers have reported that induced molting improves the post-molt performance (i.e. egg production, egg quality, and egg weight) of laying hens compared with the pre-molt performance (**Christmas *et al.*, 1985; Zimmermann *et al.*, 1987 and Salem *et al.*, 2005**).

Conventional induced molting methods have used fasting of hens for shorter periods or to a targeted body weight with or without water restriction (**Zimmermann *et al.*, 1987; Rolon *et al.*, 1993 and Buhr and Cunningham 1994**). This method efficiently induces a molt because it is management friendly and economically advantageous, and it results in satisfactory post molt performance for the commercial layer industry (**Brake, 1993**). But, recent concerns have been raised about animal welfare during the fasting period, because it is thought to be harmful to the hens (**Webster, 2003**). The use of various levels of dietary zinc (as zinc oxide) for inducing pauses in egg production had reported by several researchers (**McCormick and Cunningham, 1984 and 1987; Berry and Brake, 1987; Breeding *et al.*, 1992 and Bell, 2003**).

Plasma estradiol decreased when molting was induced, (**Elaroussi *et al.*, 1993**). They added that, reproduction ceased when the estrogen Antiguans (tamoxifen) was administrated to laying hens. Plasma estradiol increased with increasing estradiol (E_2) dosages applied (**Qin and Klandorf, 1995**). Estradiol reduced feed intake and fitness, increased plasma T_3 and T_4 without affecting the resting metabolic rate, raised plasma total lipids and reduced fat deposition in its depots sites to increase its availability for yolk production (**Jaccoby *et al.*, 1995**).

Indomethacin inhibits prostaglandin biosynthesis (**Seeley and Rodny, 1983; Murakami *et al.*, 1991; Mazes and Hidas, 1992 and Magdi, 1993**). This inhibitory effect leads to blockage of ovulation. Prostaglandins play a role in ovulatory process within the ovary (**Armstrong and Grinwich, 1972; Yang *et al.*, 1973 and 1974 and Wallach *et al.*, 1975**). **Wallach *et al.*, (1975)** noted that, PGF2α injection caused not only ovulation, but also induced oocyte maturation

Bromocriptine is an inhibitor of prolactin (**Magdi, 1993**). **Parker (1979)** reported that, bromocriptine (a dopamine against) is used widely for treatment of prolactinomas. In addition, Buys et al. (1990) noted that, a high dopamine level inhibits prolactin secretion. Vender et al. (1977) found that, bromocriptine induced ovulation. Reddy et al. (2006) noted that, birds fed with bromocriptine significantly reduced the prolactin concentration, increased estrogen and progesterone.

Human Chorionic Gonadotrophin (HCG) injection had highly significant effect on most productive and reproductive traits in fowl. The injection with HCG increases body weight and induced female sexual hormones (especially estrogen) surge but feed consumption did not (Soliman et al., 1997). Magdi, (1993) found that, injection with HCG stimulate ovarian follicles formation with subsequent increase estradiol secretion.

The aim of the current study was to detect the effect of different molting procedures and some hormonal treatments on the post molt productivity and some physiological traits.

MATERIALS AND METHODS

The present study was carried out at the Poultry Research Farm belonging to Animal Production Department, Faculty of Agriculture, Benha University. Two hundred and seventy Hy-Line laying hens aged 60 weeks were randomly chosen from a large commercial flock. All hens were approximately of an equal body weight (Mean ± S.E) and similar performance. Birds were leg banded, and divided into three groups. Birds of the first group (30 birds) were fed ad-libitum and considered as control. The second group (120 birds) was force molted by adding 1% zinc oxide on diet for 14 days. While birds of the third group (120 birds) were force molted by feed restriction (25%) for 7 days, then fasting fore subsequent 7 days. When hens of second and third groups completely ceased egg production, nine experimental groups of 30 hens each were formed and treated as shown in table (1) to detect the response of molted hens to the hormonal treatments investigated. All groups were housed in floor pens at a density of 5 hens /

m2. All birds were reared under the same managerial and hygienic conditions and fed laying ration as indicated in table (2).

Birds were individually weighed at the beginning of the experiment, at two weeks of molt treatments and at monthly intervals after molting up to the end of the experimental period which lasted sixteen weeks.

Feed consumption and conversion, egg production, egg weight and egg mass were determined.

Table (1): Experimental design and number of birds.

Molt induction method	**Post-molt hormonal treatments**
Non molted (n=30)	1- Control
1% dietary zinc oxide for 14 days (n=120)	2- Injection with 1 ml distilled water (d.w.) for 6 days (n=30). 3- Injection with 10 mg/1 ml (d.w).estradiol 17 ß for 6 days (n=30). 4- Injection with 10 mg/1 ml (d.w.) Indomethacin for 3 days followed by 10 mg Bromocriptine for 3 days (n=30). 5- Injection with Human Chorionic Gonadotrophin (HCG) 50 IU for 6 days (n=30).
Feed restriction (25%) for 7 days followed by fasting for further 7 days (n=120)	6- Injection with 1 ml distilled water (d.w.) for 6 days (n=30). 7- Injection with 10 mg/1 ml (d.w.) estradiol 17 ß for 6 days (n=30). 8- Injection with 10 mg/1 ml (d.w.) Indomethacin for 3 days followed by 10 mg Bromocriptine for 3 days (n=30). 9- Injection with Human Chorionic Gonadotrophin (HCG) 50 IU for 6 days (n=30).

Heparinized blood samples were obtained from wing vein of four hens chosen randomly per each treatment for the determination of plasma Estrogen, Progesterone, T_3 and T_4 levels and T_3/T_4 ratio. Hormonal assays measured before molt, at the 2nd week of molt treatments and at 4, 8, and 12 weeks after molt. Radioimmunoassay of plasma samples of tetraiodothyronine (T_4), triiodothyronine (T_3), estrogen (E_2) and progesterone (P_4) were carried out at the laboratories of endocrinology research unit, radiobiology department, nuclear research center, Atomic Energy Authority. Tetraiodothironine(T_4) Radioimmunoassay (RIA) was estimated according to **EL-Banna *et al.*, 1992 a and b**.

Plasma progesterone (P_4) Radioimmunoassay was estimated according to **EL-Banna and Gamal (1986)**, and plasma estradiol (E_2) Radioimmunoassay was estimated according to **EL-Banna *et al.* (1988)**.

- All data were analyzed using the general linear model procedure (GLM) of **SAS program (1996)** according to the following model:

$$Y_{ij} = \mu + T_i + e_{ij}$$

Where:

Y_{IJ} = The observation of the j^{th} individual in the i^{th} treatment; μ = The overall mean; T_i = The effect of the i^{th} treatment; e_{ij}= the random error.

Test of significance for differences were done using **Duncan (1955)** multiple comparison option in SAS software **(SAS, 1996)**.

RESULTS AND DISCUSSION

1- Body weight:

Results concerning BW changes due to investigated molting and hormonal treatments are presented in table (3). It is worthy notice that detecting the effect of methods of force molting could be achieved through comparing the results of control, hens fed 1 % zinc oxide and injected with distilled water and their corresponding fasted ones. Differences among the other groups are mainly due to hormonal treatments within each force molting treatment.

As shown in table (3) it could be observed that all force molting treatments applied caused significant decrease in live body weight. Similar results were reported by **EL-Gendi (1992)**; **Hurwitz *et al.* (1995)** and **Alodan and Mashaly (1999)** who found that, force molted hens were significantly lighter than the non- molted ones. Treatments varied in their rate of regression in body weight, where it was more pronounced in group, 6 (24.6%) whe. compared with group, 1 (9%). In general, all fast molted groups had significantly the higher rate of decrease in their live body weight when compared with those molted groups by zinc oxide supplemenation (After two weeks of treatment). Increased rate of body weight loss in fast molted hens may be attributed to the increasing in catabolic reactions which may have occurred due to feed withdrawal. Similar results were observed by Brake and **Mc Daniel (1981)** who found that, body weight loss occurs in almost linear relationship with length of fasted (feed withdrawal) time. In addition, loss in body weight of zinc oxide molt birds may be attributed to the decrease in the amount of feed consumption due to unplatability of diet supplemented with zinc oxide. Similar results were reported by **Berry and Brake (1985)** who attributed the decrease in body weight of force molted hens to negative nitrogen balance due to the catabolic reactions in skeletal muscle, utilization of adipose tissue, decrease of liver weight and involution of the reproductive organs. The same conclusion was reported by **Ghatas (1994)**. After molting birds started compensatory growth and all treatments showed the same trend. However, the rate of body weight increase varied among treatments. Force molted hens by zinc oxide and injected with

estradiol 17 ß had the highest rate of increase at 8th week after molting. On the other hand, fasted hens injected with HCG had the highest rates of increase at 14th and 16th week after molting. This seems to be logic since the metabolic processes are directly and significantly affected with the hormonal status of the bird's organism. It is well known that, ovarian hormone estradiol 17 ß is the most important hormone that directly affects the rate of metabolism and may result in an increase in body weight through its effect on the nitrogen balance and fat formation and mobilization.

2. Feed consumption:

Averages of feed consumption estimated as gm/hen/day for birds of different experimental groups are shown in table (4). Differences in the amount of feed consumption found in birds of different experimental groups' lust before molting treatments was insignificant. After molting, average of feed consumption increased during the first four to six weeks and remained approximately constant during the rest of the experiment. Hens of non-molted group had approximately the same trend in the amount of feed consumed/day before or after molting period.

After molting, the amount of feed consumption sharply increased in fasted hens injected with distilled water up to the12th week with significant differences when compared with those fed 1% zinc oxide and injected with distilled water. Results obtained agreed with those of **Park *et al.* (2004)** who found significant difference in feed intake when they used various methods of force molting inducing zinc oxide, zinc propionate and feed withdrawal.

Fast molted hens injected with estradiol 17 ß had significantly the lower average of feed consumption at all experimental intervals. These results agree with those of **Jaccoby *et al.* (1995)** who reported that, estrogen reduced feed intake. On the other hand, fast molted hens injected with Indo. + Bromo. had significantly ($P<0.001$) the highest average of feed consumption when compared with all treatments applied.

3-Feed conversion:

As shown in table (4) just before molt feed conversion differed significantly between different treatments applied. After two weeks of molting, feed conversion increased then decreased with fluctuated rates toward the end of the experimental period. This was quite true in all experimental groups (table, 4). Non-molted hens (control) had significantly the highest value of feed conversion at all experimental intervals when compared with all force molted experimental groups. This may lead to conclude that, force molting significantly decreased feed conversion.

Similar results were reported by **Soliman (1993)**. However, fasted hens injected with distilled water had significantly ($P<0.001$) the highest values of feed conversion than those fed 1% zinc oxide and injected with distilled water at all experimental intervals.

On the other hand, fast molted hens injected with estradiol 17 ß improved significantly feed conversion compared with different treatments applied. This result may be attributed to the effect of estradiol on increasing egg production rate which resulted in improving feed conversion average. Similar results were observed by **Khalifa *et al.* (1983)** who found that, egg number increased by treating hens with estradiol and **Jaccoby *et al.* (1995)** who reported that, estradiol reduced feed intake.

4-Egg production rate:

Table (5) shows the variability in hen-day egg production rates for the various experimental treatments all over the experimental period. Non-molted hens had significantly the lowest rates of egg production at all experimental intervals after molting. On the other hand, after-molting egg production sharply increased with different rates between all force molted treatments. The increase of egg production after force molting mainly due to the rest-period which resulted in recycling and rejuvenating of the molted hens for another season of egg production. Hens fed 1% zinc oxide and injected with distilled water increased the rate of egg production when compared with those fasted ones at almost experimental intervals. This lead to observe that, applying zinc oxide as a method of molt induction had better effect on the rate of egg production when compared with fasting method. These results are in agreement with those of **Park *et al.* (2004)** and **Salem *et al.* (2005)** who reported that, egg production of force molted hens was higher by 1% zinc than that for hens undergoing feed withdrawal. On the other hand, variation in egg production rate between force molted birds and controls was of significant value.

Hens fed 1% zinc oxide and injected with HCG reached their peak of egg production 2 weeks early (at the 4^{th} week after molting). At the same time, they had significantly the highest rates of egg production at all experimental intervals when compared with other treatments applied. These results are in agreement with those of **Soliman *et al.* (1997)** who stated that, HCG injection showed a highly significant effect on most productive and reproductive traits in fowl. Injection with HCG stimulates ovarian follicles formation with subsequent increase estradiol secretion **(Magdi, 1993)**. After peak of egg production all experimental groups decreased in their egg production gradually with different rates up to the end of the experimental period.

5- Egg weight:

As shown in table (6) egg weight significantly varied between all experimental groups at all estimation intervals. Average egg weight increased slightly reached its highest value at the 6th week after molting then, it changed up to the end of experimental period with no recognized trend.

Fasted hens injected with distilled water had significantly the lowest average of egg weight at the 2nd week after molting when compared with other treatments applied or control. On the other hand, it had significantly the higher rates at 4th, 6th and 16th week only when compared with those fed 1% zinc oxide and injected with distilled water. Hens force molted with zinc oxide and injected with HCG recorded significantly the lowest values of egg weight at the 8th week after molting up to the end of the experimental period when compared with other treatments applied and non-molted ones. On the other hand, fasted hens injected with HCG recorded the highest values in their egg weight at the 2nd, 6th, 14th and 16th week after molting compared with all treatments applied. This may be due to the negative correlation between egg weight and egg production.

6- Egg mass:

Averages of egg mass for birds of different experimental groups estimated as gram per hen per day at all the experimental intervals are shown in table (6). Before molt induction, average of egg mass in all experimental groups of hens ranged from 34.55 to 37.90 gm/hen/day it sharply decreased in all force molted groups during the first two weeks after molt induction. The rate of decrease was greater in fast molted hens injected with HCG. After molt egg mass started to increase with different magnitude and continued to increase sharply during the second two weeks after molt and steadily towards the end of the experimental period with different rates within the different experimental groups. On the other hand, non-molted hens (control) had opposite trend. It is quite logic since egg mass is the product of multiplying egg number with egg weight. Treating hens after molting with either HCG or estradiol resulted in relatively higher egg mass value at most periods of estimation. These results may be due to the significant effect of the hormonal treatment on either egg production or weight, **Khalifa *et al.* (1983)** and **Whitehead (1995)** concluded the same conclusion.

8- Plasma estradiol and progesterone levels:

Data presented in table (7) show plasma estradiol and progesterone levels, respectively in birds of different experimental groups. Birds force-molted via dietary zinc oxide and injected with distilled water showed

higher levels of estradiol at 2nd week of molt treatments when compared with those force-molted through feed restriction followed by fasting and injected with distilled water. By the 12th week the two groups recorded the highest estradiol level compared to the other groups. This may lead to conclude that, applying zinc oxide for molt induction may affect the ovarian function estimated as estradiol 17ß secretion rate. In addition, zinc oxide may also maintain the hypothalamic hypopheseal ovarian axis in approximately props status which may shorten the time needed to attain satisfactory egg production rate after molt. This may increase egg production during the second year. On the other hand feed deprivation greatly decreased plasma estradiol level. This may be attributed to insufficiency of energy level available for various biological reactions concerning metabolic and hormonal coordination.

Plasma estradiol level was higher in fast molted hens injected with HCG and their corresponding fed zinc oxide at 4 and 8 weeks after molting, respectively. This is quite logic since HCG stimulates ovarian function and ovarian follicle growth. These results are in agreement with those of **Soliman *et al.* (1997)** who stated that, injection with HCG induced female sexual hormones (especially estrogen) surge.

On the other hand, non-molted hens recorded its highest plasma estradiol 17ß level at 4th week then, it decreased up to the 12th week.

Birds fed 1% zinc oxide and injected with distilled water had significantly the highest levels of plasma progesterone, at all intervals after molting when compared with their corresponding fasted one. Approximately similar results were obtained concerning the effect of methods of molt induction on plasma progesterone level. It decreased when molt was induced with greater rate in case of fasting than when zinc oxide was applied.

Along the experimental period variation in estradiol and progesterone levels was observed. The higher estradiol level was found at 4th weeks after molt which coincided with observed lower level of progesterone .This may be due to the negative correlation between the two ovarian hormones.

9-Plasma triiodothironine (T_3) and tetraiodothironine (T_4) levels and T_3/T_4 ratio:

As shown in table (8) plasma T_3 levels increased after two weeks of molting. The highest T_3 level was observed at the 12th week after molt. However, the highest T_4 level was observed during molt (table, 8).

After molting applying fasting as a method of force molting significantly decreased plasma T_3 and increased plasma T_4 level. This is accepted since thyroid hormones are mainly involved in metabolic processes in general and energy metabolic in particular. In fasting period adrenal glucocorticoid hormone especially (cortisol) is active as a trial of the organism to get energy from another source rather than carbohydrate (fat and proteins). Correspondingly thyroid hormones are needed for oxidation reaction thus their rate of secretion may increase correspondingly. These results agree with those obtained by **Peths et al., (1982)** and **Hoshino *et al.* (1988)** who found significant increase in plasma T_4 level during molting.

After molting fast molted hens injected with distilled water had the lowest average of plasma T_3 level at all intervals when compared with their corresponding fed zinc oxide ones. On the other hand, hens fed 1% zinc oxide then injected with estradiol 17 ß (at the 4th week) and those injected with Indo. + Bromo. (at the 8th week) or those of fast molted which were injected with HCG (at the12th week) had significantly the highest values of plasma T_3 level when compared with other treatments applied. The previous results agree with those of **Magdi (1993)** and **Jaccoby *et al.* (1995)** who found that, estradiol injected decreased serum T_4 and increased serum T_3 level.

Hens fed 1% zinc oxide and injected with Indo. + Bromo. significantly increased T_3/T_4 ratio at 8th and 12th weeks after molting followed by those injected with estradiol at 4th week respectively (table, 8).

Table (2): Composition and calculated nutritional values for the experimental diet.

Ingredient	%
Yellow corn	62.00
Soybean meal (44%)	12.50
Layer concentrate (44%)	10.00
Wheat bran	9.50
Limestone	6.00
Calculated analysis:	
Crude protein %	16.34
Metalizable energy (K cal/kg diet)	2822.6
Calcium %	3.17
Total phosphorus %	0.65

Table (3): Averages of body weight of birds of different experimental groups as affected by molt induction methods and hormonal treatments applied.

Treatments		Body weight (gm)						Grand mean
Molt induction methods	Hormonal treatments	Just before molt treatments	After 2 weeks of molting	After molting period (weeks)				
				4	8	12	16	
Non-molted	Control	1293	1294^{a}	1301^{c}	1351^{b}	1393^{c}	1447^{c}	1347
Zinc oxide	Distilled water	1304	1186^{b}	1343^{a}	1350^{b}	1392^{c}	1429^{d}	1334
	Estradiol 17β	1302	1157^{d}	1326^{b}	1390^{a}	1445^{a}	1497^{a}	1353
	Indomethacin + Bromocriptine	1284	1172^{b}	1273^{e}	1309^{c}	1358^{d}	1406^{e}	1300
	HCG	1302	1150^{e}	1284^{d}	1294^{e}	1341^{e}	1398^{f}	1295
Fasting	Distilled water	1295	976^{i}	1226^{g}	1231^{g}	1265^{h}	1366^{h}	1227
	Estradiol 17β	1288	1030^{g}	1267^{f}	1301^{d}	1328^{f}	1388^{g}	1267
	Indomethacin + Bromocriptine	1307	1055^{f}	1328^{b}	1389^{a}	1437^{b}	1481^{b}	1330
	HCG	1288	1021^{h}	1228^{h}	1240^{f}	1318^{g}	1404^{e}	1250
SEM		29	23	20	20	20	20	

a,b,c…: Means in the same column with common superscripts are not significant different (P<0.05)

Table (4): Averages of feed consumption (gm) and feed conversion (gm feed / gm egg) of birds of different experimental groups as affected by molt induction methods and hormonal treatments applied.

Treatments		Just before molt treatments		After molting period (weeks)																Grand mean	
				2		4		6		8		10		12		14		16			
Molt induction methods	Hormonal treatments	F. Cons.	F. Conv.	F. Cons.	F. Conv	F. Cons.	F. Conv	F. Cons.	F. Conv.	F. Cons.	F. Conv.	F. Cons.	F. Conv	F. Cons.	F. Conv	F. Cons.	F. Conv.	F. Cons.	F. Conv	F. Cons	F. Conv
Non-molted	Control	150	4.12^{b}	151^{a}	8.50^{a}	137^{d}	7.35^{a}	138^{d}	7.03^{a}	137^{d}	7.82^{a}	137^{d}	6.93^{a}	137^{d}	7.14^{a}	137^{d}	7.19^{a}	137^{c}	12.62^{a}	140	7.63
Zinc oxide	Distilled water	152	4.15^{bc}	140^{bc}	5.85^{c}	141^{d}	3.92^{c}	142^{cd}	4.70^{b}	137^{d}	3.48^{f}	135^{d}	4.35^{d}	135^{d}	4.53^{c}	135^{d}	4.53^{f}	135^{c}	4.53^{f}	139	4.45
	Estradiol 17β	151	4.04^{c}	142^{b}	8.07^{b}	146^{c}	3.06^{f}	146^{c}	2.98^{g}	146^{c}	4.02^{e}	142^{c}	3.91^{e}	142^{c}	3.91^{g}	142^{c}	4.70^{e}	142^{b}	4.70^{e}	144	4.38
	Indomethacin + Bromocriptine	151	4.12^{b}	142^{b}	7.80^{c}	146^{c}	3.72^{d}	146^{c}	3.51^{e}	146^{c}	3.51^{f}	142^{c}	3.93^{e}	142^{c}	4.53^{c}	142^{c}	4.53^{f}	142^{b}	4.69^{e}	144	4.48
	HCG	151	4.39^{a}	139^{b}	8.04^{b}	143^{cd}	3.05^{f}	151^{b}	3.28^{f}	142^{c}	3.53^{f}	142^{c}	3.58^{f}	142^{c}	4.11^{f}	141^{cd}	4.37^{g}	139^{b}	4.80^{d}	143	4.35
Fasting	Distilled water	151	4.34^{a}	151^{a}	6.68^{d}	151^{b}	4.34^{b}	146^{c}	3.89^{d}	145^{c}	4.56^{c}	143^{c}	4.95^{c}	140^{c}	4.84^{d}	137^{d}	5.87^{b}	126^{d}	5.41^{b}	143	4.99
	Estradiol 17β	150	4.00^{d}	102^{e}	6.79^{d}	125^{c}	3.03^{f}	136^{d}	3.27^{f}	132^{d}	3.18^{g}	132^{d}	3.61^{f}	128^{e}	3.48^{h}	126^{e}	4.15^{h}	119^{e}	3.91^{g}	128	3.94
	Indomethacin + Bromocriptine	150	4.16^{bc}	115^{d}	5.07^{g}	158^{a}	3.04^{f}	174^{a}	4.27^{c}	174^{a}	5.01^{b}	169^{a}	5.62^{b}	169^{a}	5.62^{b}	169^{a}	5.62^{c}	150^{a}	5.01^{c}	159	4.82
	HCG	150	4.10^{b}	136^{c}	4.96^{h}	141^{d}	3.35^{e}	142^{c}	2.86^{h}	161^{b}	4.33^{d}	161^{b}	4.38^{d}	151^{b}	4.96^{c}	151^{b}	4.96^{d}	151^{a}	4.96^{cd}	149	4.32
SEM		0.54	0.02	0.54	0.02	0.54	0.02	0.54	0.02	0.54	0.02	0.54	0.02	0.54	0.02	0.54	0.02	0.54	0.02		

F. cons. = Feed consumption , F. Conv. = Feed conversion

a,b,c…: Means in the same column with common superscripts are not significant different ($P<0.05$)

Table (5): Egg production rate of birds of different experimental groups as affected by molt induction methods and hormonal treatments applied.

Treatments		Egg production (%/hen/day)									Grand mean
Molt induction methods	Hormonal treatments	Just before molt treatments	After molting period (weeks)								
			1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	
Non-molted	Control	60.1^{c}	30.2^{e}	30.3^{h}	31.1f	29.7^{i}	34.2^{g}	33.2^{d}	30.6^{e}	19.5^{b}	29.9
Zinc oxide	Distilled water	62.1^{a}	40.2^{b}	60.2^{g}	50.2^{e}	66.2^{d}	52.2^{d}	50.1^{c}	50.1^{c}	50.1^{a}	53.5
	Estradiol 17β	62.1^{a}	29.2^{f}	79.1^{b}	81.1^{a}	60.2^{f}	60.2^{c}	60.2^{a}	50.1^{c}	50.1^{a}	59.1
	Indomethacin + Bromocriptine	61.1^{b}	30.2^{e}	65.1^{e}	69.1^{b}	69.1^{b}	62.2^{b}	52.1^{b}	52.1^{b}	50.4^{a}	56.8
	HCG	60.2^{c}	30.2^{e}	82.1^{a}	80.4^{a}	70.2^{a}	69.2^{a}	60.2^{a}	56.2^{a}	50.4^{a}	62.1
Fasting	Distilled water	60.1^{c}	39.1^{c}	60.2^{g}	65.2^{d}	55.1^{h}	50.2^{f}	50.2^{c}	40.2^{d}	50.2^{a}	52.3
	Estradiol 17β	62.0^{a}	24.1^{g}	68.2^{d}	68.2^{c}	68.2^{c}	60.2^{c}	60.2^{a}	50.2^{c}	49.8^{a}	56.8
	Indomethacin + Bromocriptine	60.2^{c}	33.2^{d}	63.2f	68.2^{c}	58.2^{g}	50.1^{f}	50.1^{c}	50.1^{c}	50.1^{a}	53.7
	HCG	60.2^{c}	45.1^{a}	69.2^{c}	81.1^{a}	61.2^{e}	60.4^{c}	50.2^{c}	50.2^{c}	50.2^{a}	58.6
SEM		0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	

a,b,c…: Means in the same column with common superscripts are not significant different (P<0.05)

Table (6): Averages of egg weight (gm) and egg mass (gm egg /hen/day) of birds of different experimental groups as affected by molt induction methods and hormonal treatments applied.

Treatments		Just before molt treatments		After molting period (weeks)																Grand mean	
Molt induction methods	Hormonal treatments			2		4		6		8		10		12		14		16			
		E.W.	E.M.	E.W.	E.M.	E.W.	E.M.	E.W.	E.M.	E.W.	E.M.	E.W.	E.M.	E.W.	E.M.	E.W.	E.M.	E.W.	E.M.	E.W.	E.M.
Non-molted	Control	59.3^{c}	35.70^{d}	58.3^{b}	17.80^{ef}	61.5^{c}	18.70^{f}	62.7^{b}	19.70^{g}	59.0^{c}	17.50^{h}	57.8^{b}	19.77^{g}	57.8^{bc}	19.22^{i}	62.3^{c}	19.10^{g}	55.7^{f}	10.86^{f}	59.4	19.82
Zinc oxide	Distilled water	62.5^{a}	36.57^{b}	58.4^{b}	24.01^{b}	60.5^{d}	35.99^{a}	61.8^{bc}	30.00^{c}	59.6^{bc}	39.55^{c}	58.2^{b}	31.19^{d}	57.1^{c}	29.98^{g}	62.5^{c}	29.98^{d}	62.5^{c}	29.98^{c}	60.3	31.92
	Estradiol 17β	61.7^{ab}	37.53^{a}	56.9^{c}	17.61^{f}	61.8^{c}	47.80^{a}	61.5^{c}	49.00^{a}	58.7^{cd}	36.34^{d}	60.5^{a}	36.34^{c}	56.3^{c}	36.00^{e}	62.8^{bc}	30.28^{cd}	63.4^{b}	30.28^{ab}	60.4	35.69
	Indomethacin + Bromocriptine	61.2^{b}	36.86^{b}	60.2^{a}	18.18^{ef}	58.8^{e}	39.27^{b}	61.3^{c}	41.68^{b}	58.3^{d}	41.68^{a}	56.9^{c}	36.28^{c}	55.3^{d}	31.43^{g}	62.9^{bc}	31.43^{b}	60.9^{d}	30.40^{ab}	59.5	34.13
	HCG	58.0^{d}	34.55^{c}	56.4^{c}	17.31^{f}	60.6^{d}	47.11^{a}	61.5^{c}	46.15^{a}	54.0^{e}	40.27^{b}	53.1^{d}	39.70^{b}	53.1^{e}	34.55^{e}	60.1^{d}	32.24^{d}	58.2^{c}	28.90^{d}	57.2	35.64
Fasting	Distilled water	53.7^{e}	34.82^{c}	55.6^{c}	22.66^{c}	62.1^{c}	34.83^{b}	67.2^{a}	37.73^{b}	58.7^{cd}	31.91^{e}	56.3^{c}	29.05^{f}	56.3^{c}	29.05^{h}	60.3^{d}	23.28^{e}	63.4^{b}	23.28^{c}	59.3	29.62
	Estradiol 17β	58.7^{cd}	37.90^{a}	59.3^{ab}	14.70^{g}	66.6^{a}	41.58^{a}	58.8^{d}	41.58^{b}	61.4^{a}	41.58^{a}	60.9^{a}	36.72^{b}	61.8^{a}	36.72^{d}	63.0^{ab}	30.60^{c}	62.5^{c}	30.40^{ab}	61.4	34.64
	Indomethacin + Bromocriptine	60.9^{b}	36.10^{c}	58.2^{b}	19.93^{d}	59.5^{e}	37.89^{b}	61.5^{c}	40.89^{a}	59.4^{bc}	34.89^{f}	57.8^{b}	30.08^{g}	61.9^{a}	30.08^{i}	63.7^{ab}	30.08^{d}	63.7^{b}	30.08^{b}	60.7	32.22
	HCG	59.5^{c}	36.69^{b}	61.1^{a}	27.53^{a}	64.8^{b}	42.20^{a}	68.0^{a}	49.49^{a}	60.1^{b}	37.30^{d}	57.8^{b}	36.85^{d}	58.8^{b}	30.61^{g}	64.0^{a}	30.61^{c}	68.7^{a}	30.61^{a}	62.5	35.77
SEM		1.8	0.05	1.8	0.05	1.8	0.05	1.8	0.05	1.8	0.05	1.8	0.05	1.8	0.05	1.8	0.05	1.8	0.05		

E.W. = Egg weight , E.M.= Egg mass

a,b,c…: Means in the same column with common superscripts are not significant different (P<0.05)

Table (7): Plasma estradiol and progesterone level (ng/dl) of birds of different experimental groups as affected by molt induction methods and hormonal treatments applied.

Treatments		Just before molt treatments		After 2 weeks of molting		After molting period (weeks)					
						4		8		12	
Molt induction methods	Hormonal treatments	Est.	Prog.	Est.	Prog.	Est.	Prog.	Est.	Prog.	Est.	Prog.
Non-molted	Control	2.54^{c}	3.228^{e}	5.06^{a}	0.487^{e}	7.06^{e}	0.899^{b}	4.05^{e}	3.687^{d}	2.58^{b}	2.801^{c}
Zinc oxide	Distilled water	2.28^{f}	5.039^{c}	5.03^{a}	0.39^{g}	9.20^{a}	0.38^{e}	4.49^{d}	5.5^{a}	5.17^{a}	2.308^{e}
	Estradiol 17β	4.37^{b}	0.654^{i}	3.32^{c}	0.725^{d}	4.7^{g}	0.201^{f}	2.47^{f}	1.036^{f}	1.71^{e}	4.855^{b}
	Indomethacin + Bromocriptine	2.81^{d}	1.146^{g}	5.05^{a}	2.46^{a}	5.14^{f}	4.494^{a}	5.25^{b}	5.451^{a}	0.95^{f}	2.645^{d}
	HCG	0.11^{i}	0.918^{h}	2.48^{d}	0.449^{f}	8.98^{b}	0.851^{c}	5.95^{a}	5.007^{b}	0.91^{f}	2.645^{d}
Fasting	Distilled water	0.40^{h}	2.929^{f}	0.04^{g}	0.478^{ef}	3.53^{h}	0.238^{f}	2.15^{g}	2.747^{e}	5.23^{a}	0.339^{g}
	Estradiol 17β	1.25^{g}	5.391^{b}	0.29^{f}	0.797^{c}	8.22^{c}	0.141^{g}	4.78^{c}	0.219^{g}	2.44^{c}	5.321^{a}
	Indomethacin + Bromocriptine	5.14^{a}	5.689^{a}	0.93^{e}	0.79^{c}	7.6^{d}	0.578^{d}	2.08^{g}	4.53^{c}	2.37^{c}	1.681^{f}
	HCG	3.33^{c}	4.04^{d}	4.26^{b}	0.93^{b}	9.2^{a}	0.246^{f}	4.05^{e}	4.961^{b}	1.86^{d}	2.641^{d}
SEM		0.2	0.03	0.2	0.03	0.2	0.03	0.2	0.03	0.2	0.03

Est. = estradiol, Prog = progesterone.

a,b,c…: Means in the same column with common superscripts are not significant different ($P<0.05$)

Table (8): Plasma T_3, T_4 and T_3/T_4 ratio (ng/dl) of birds of different experimental groups as affected by molt induction methods and hormonal treatments applied.

Treatments		Just before molt treatments			After 2 weeks of molting			After molting period (weeks)								
								4			8			12		
Molt induction methods	Hormonal treatments	T_3	T_4	T_3/T_4	T_3	T_4	T_3/T_4	T_3	T_4	T_3/T_4	T_3	T_4	T_3/T_4	T_3	T_4	T_3/T_4
Non-molted	Control	0.404^{d}	0.854^{d}	0.473^{c}	0.608^{b}	2.533^{c}	0.240^{d}	0.610^{d}	2.414^{c}	0.238^{c}	0.710^{d}	1.307^{d}	0.541^{c}	1.393^{c}	0.886^{c}	1.579^{d}
Zinc oxide	Distilled water	0.393^{e}	0.561^{e}	0.700^{d}	0.912^{a}	2.658^{d}	0.343^{c}	0.369^{e}	3.309^{c}	0.120^{g}	0.646^{e}	0.969^{f}	0.667^{d}	0.988^{e}	0.409^{f}	2.416^{c}
	Estradiol 17β	0.194^{h}	0.452^{f}	0.429^{f}	0.515^{c}	2.968^{c}	0.174^{f}	0.984^{a}	0.739^{g}	1.33^{a}	0.824^{c}	0.692^{g}	1.19^{b}	1.011^{e}	1.396^{a}	0.724^{i}
	Indomethacin + Bromocriptine	0.751^{a}	0.958^{c}	0.784^{c}	0.276^{f}	2.286^{f}	0.965^{a}	0.761^{b}	0.508^{i}	0.149^{e}	2.185^{a}	1.370^{c}	1.76^{a}	2.431^{b}	0.702^{e}	3.46^{a}
	HCG	0.253^{f}	1.708^{a}	0.148^{h}	0.247^{g}	0.660^{h}	0.374^{b}	0.668^{c}	0.681^{h}	0.981^{b}	0.964^{b}	1.242^{e}	0.776^{c}	0.647^{f}	0.702^{e}	0.922^{g}
Fasting	Distilled water	0.178^{h}	1.324^{b}	0.134^{i}	0.304^{e}	2.222^{g}	0.137^{g}	0.133^{f}	0.980^{f}	0.136^{f}	0.326^{f}	2.818^{a}	0.116^{i}	0.927^{f}	0.831^{d}	1.116^{f}
	Estradiol 17β	0.210^{g}	0.856^{d}	0.232^{g}	0.523^{c}	2.658^{d}	0.197^{e}	0.401^{e}	5.082^{b}	0.079^{h}	0.204^{h}	0.991^{f}	0.206^{g}	1.00^{e}	1.221^{b}	0.819^{h}
	Indomethacin + Bromocriptine	0.561^{c}	0.409^{g}	1.37^{a}	0.113^{h}	5.393^{b}	0.020^{i}	0.968^{a}	5.209^{a}	0.186^{d}	0.221^{h}	0.459^{h}	0.481^{f}	1.306^{d}	0.881^{c}	1.482^{c}
	HCG	0.710^{b}	0.564^{e}	1.26^{b}	0.469^{d}	5.962^{a}	0.080^{h}	0.382^{e}	3.038^{d}	0.126^{g}	0.283^{g}	1.915^{b}	0.148^{h}	2.834^{a}	0.892^{c}	3.177^{b}
SEM		0.48	0.11	0.05	0.48	0.11	0.05	0.48	0.11	0.05	0.48	0.11	0.05	0.48	0.11	0.05

a,b,c…: Means in the same column with common superscripts are not significant different ($P<0.05$)

REFERENCES

Alodan M. A. and Mashaly, M. M. (1999). *Effect of induced molting in laying hens on production and immune parameters. Poult. Sci. 78:171-177.*

Armstrong, D. T. and Grinwich, D. L. (1972). *Blockade of spontaneous and LH-induced ovulation in rates by indomethacin, an inhibitor of prostaglandin biosynthesis. Prostaglandins, 1:21-28.*

Bell, D. D. (2003). *Historical and current molting practices in the US table egg industry. Poult. Sci. 82:965–970.*

Berry, W. D. and Brake, J. (1985). *Comparison of parameters associated with molt induced by fasting, zinc and low dietary sodium in caged layers. Poult. Sci.64:2027-2036.*

Berry, W. D. and Brake, J. (1987). *Post-molt performance of laying hens molted by high dietary zinc, low dietary sodium and fasting: egg production and egg shell quality. Poult. Sci. 66 (2):218-226.*

Brake, J. (1993). *Recent advances in induced molting. Poult. Sci. 72:929-931.*

Brake, J. and Mc-Daniel, G. R. (1981). *Factors affecting broiler breeder performance.3. relationship of body weight during fasting to post-molt performance. Poult. Sci.60:726.*

Breeding, S. W., Brake, J., Garlich, J. D. and Johnson, A. L. (1992). *Molt induced by dietary zinc in a low calcium diet. Poult. Sci. 71:168-180.*

Buhr, R. J., and Cunningham, D. L. (1994). *Evaluation of molt induction to body weight loss of fifteen, twenty, or twenty-five percent by feed removal daily limited or alternative day feeding of a molt feed. Poult. Sci. 73:1499–1510.*

Buys, N., Peeters, R. and Declereck, B. (1990). *Seasonal variation in prolactin, growth hormone and thyroid hormones and the prolactin surge at ovulation do not affect litter size of ewes during pregnancy in the oestrous or the anoestrous season. J. Reprod. Firtil. 90(1):47-53.*

Christmas, R. B., Harms, R. H. and Junquera, O. M. (1985). *Performance of Single Comb White Leghorn subjected to 4 or 10 day feed withdrawal force rest procedures. Poult. Sci. 64:2321-2324.*

Duncan, D. B. (1955). *Multiple range and multiple F test. Biometrics, 33:1-42.*

Elaroussi, M. A., Forte, L. R., Eber, S. L. and Biellier, H. V. (1993). *Adaptation of the kidney during reproduction: Role of estrogen in the regulation of the responseivenss to parathyroid hormone. Poult. Sci. 72(8):1548-1556;29 ref.*

Elbanna, I. M. and Gamal, M. H. (1986). *Miniature system for progesterone radioimmunoassay: Economy versus sensitivity and precision. Alex. J. Agric. Res. 31(3):101-113.*

Elbanna, I. M., El-Asrag, H. A. and Gamal, M. H. (1988). *An improved method for estradiol-17β radioimmunoassay.Isotope and Rad. Res, 20 (2):141-144.*

Elbanna, I. M., El-Asrag, H. A., Ragab, M. T. and Barakat, M. (1992a). *Productionof specific thyroxine antiserum for radioimmunoassay using drevatized immunogen. Isotope and Rad. Res, 24 (1):15-22.*

Elbanna, I. M., El-Asrag, H. A., Ragab, M. T. and Barakat, M. (1992b). *A provision radio iodination technique for the production of Ta-I and T_4-^{125}I for sensitive radioimmunoassay. Isotope and Rad. Res, in press.*

El-Gendi, Gendi, G. M. (1992). *A trial to improve laying performance during the second productive year in Dokki 4 and Matrouh hens. Egypt. Poult. Sci: 12, 11 (893-912).*

Ghatas, M. S. (1994). *Studies on second year performance of force molted hens in some local chicken breeds. M. Sc. Thesis, Fac. Of Agric. Minia Uni. Egypt.*

Hoshino, S., Suzuki, M., Kakegawa, T., Imai, K., Wakita, M., Kobayashi, Y. and Yamada, Y. (1988). *Changes in plasma thyroid hormones, Luetinizing hormone (LH), estradiol, progesterone and corticosterne of laying hens during a force molt. Comparative Biochemistry and physiology. A comparative physiology, 90(2):355-359;32 ref.*

Hurwitz, S., Wax, E., Nisenbaum, Y. and Plavnik, I. (1995). *Responses of laying hens to forced molt procedures of variable length with or without light restriction. Poult. Sci., 74:1745-1753.*

Jaccoby, S., Arnon, E., Snapir, N. and Robinzon, B. (1995). *Effects of estradiol and tamoxifen on feeding, fattiness and some indocrine criteria in hypothalamic obese hens. Pharmacology Biochemistry and Behavior, 50(1):55-63.*

Khalifa, M. A., Shebaita, M. K., Kamar, G. A. R. Abdou, M. A. (1983). *Effect of thyroxine, Estradiol and ACTH on egg characters and some reproductive organs in Fayoumi. Egypt. J. Anim. Prod., 23(1-2):95-107.23, No. 1-2, Pp. 95-107.*

Magdi, H. G. I. (1993). *Relationship of sexual hormone variation with productive and reproductive activities in rabbits. Ph. D. Fac. Agric., Zagazig Uni., Benha Branch, Egypt.*

Mazes, M. and Hidas, A. (1992). *Is there lipid peroxidation induced malondialdehyde production during egg shell formation? Aceta-veterinaria-Hunarica, 40(4):297-310;16 Ref.*

McCormick, C. C., and D. L. Cunningham. (1984). *High dietary zinc and fasting as methods of forced resting: A performance comparison. Poult. Sci. 63:1201–1206.*

McCormick, C. C., and Cunningham, D. L. (1987). *Performance and physiological profiles of high dietary zinc and fasting as methods of inducing a forced rest: A direct comparison. Poult. Sci. 66:1007–1013.*

Murakami, Y., Fujihara, N. and Koga, O. (1991). *Arginie vastocin level in plasma and prostaglandin concentrations in the uterine tissue before and after premature oviposition induced by orthophosphate solution in the hen. Japanese Poultry Science, 28(1):11-19;31 ref.*

North, M. O. and Bell, D. D. (1999). *Commercial Chicken Production Manual. 4th ed. Chapman Hall, New York, USA, pp.*

Park, S. Y., Birkhold, S. G., Kubina, L. F., Nisbet, D. J. and Ricke, S. C. (2004). *Effects of high zinc diets using zinc propionate on molt induction, organs and postmolt egg production and quality in laying hens. Poult. Sci .,83:24-33.*

Parker, D. (1979). *Bromocriptine. N Engl J. Med., 301-863.*

Pethes, G.; Szeleny, Z. and Peczely, P. (1982). *Changes in the plasma concentration of thyroid hormones and sexual steroids during forced molt of male and female domestic chickens. Aceta Veterinaria Academia Scientiarum Hungarica, 30 (4):193-201, 36 ref.*

Qin, X. and Klandorf, H. (1995). *Effect of estrogen on production, shell quality and calcium metabolism in molted hens. Endocrinology, 110(1):55-59.*

Rolon A; Buhr R.J.; Cunningham D.L. (1993). *Twenty-four-hour feed withdrawal and limited feeding as alternative methods for induction of molt in laying hens. Poultry Science 72(5): 776-785.*

Reddy, I. J., David, C. G. and Raju, S. S. (2006). *Chemical control of prolactin and its effects on pause days, egg production steroid hormone concentration in Girirani birds. International Journal of Poultry Science, 5(7):685-692.*

Salem, Amina A.; Eman M. Abo-Etta and Nofal , M. E. (2005). *Productive and physiological performance of local laying hens as affected by force molting methods. Egypt. J. of Appl. Sci., 20(12):12-31.*

SAS (1996). *SAS procedure Guide. "Version 6.12 Ed". Institute Inc., Cary, N. C, USA.*

Seeley, and Rodney, R. (1983). *Effect of indomethacine on reoroduction under laboratory and field conditions in deermice (Peromyscus maniculations). Boil. Reprod., 28:148-153.*

Soliman, A. A. (1993). *A comparative study for the effects of different force molting methods on postmolt performance of broiler breeder hens. M.Sc. Thesis, Fac. Of Agric. Alexandria Uni.,Egypt.*

Soliman, A. S., EL-Gendi, G. M. and Hamouda, I. A. (1997). *Productive and reproductive performance of rabbits as affected by breed, parity,*

sex and HCG injection. International conference of animal production of health, Egypt, 519-533.

Vander, steer, H. J .and Coelingh Bennink, H. J .T. (1977): *bromoergocriptine for induction of ovulation in normoprolactinaemic post-pill an ovulation .Lancet 502, march 5.*

Webster, A. B. (2003). *Physiology and behavior of the hen during induced molt. Poult. Sci. 82:992–1002.*

Whitehead, C. C. (1995). *Plasma estrogen and regulation of egg weight in laying hens by dietary fats. Animal Feed Science and Technology,53(2):91-98.*

Wallach, Jr. L., Cenedella, R. J. Butcher, R. L. (1975). *Simplified thin-layer chromatography of prostaglandin in biological extractsprocess. Brit. Phorm.Soc.583-584.*

Yang, N.S.T.; Marsh, J. M .and Le Marie, W .j. (1973). *Prostaglandin changes induced by ovulatory stimuli in rabbit Graafian follicles: the effect of indomethacin Prostaglandins, 4:195-204*

Yang, N.S.T.; Marsh, J.M. and Le Marie, W.j. (1974). *Postovulatory changes in the concentration of prostaglandins in rabbit Graafian follicles .Prostaglandins, 6:37-44.*

Zimmermann, N. G., Andrews, D. K. and McGinnis, J. (1987). *Comparison of several induced molting methods on subsequent performance of Single Comb White Leghorn hens. Poult. Sci. 66:408–417.*

الملخص العربي

تأثير إحداث القلش الإجباري على بعض الصفات الإنتاجية والفسيولوجية في دجاج الهاي لاين

جعفر محمود الجندي*- هشام رجب سمك- أحمد محمد عبد الخالق***

*كلية الزراعة- جامعة بنها

**معهد بحوث الانتاج الحيواني- مركز البحوث الزراعية- وزارة الزراعة- مصر

أجري هذا البحث بمزرعة بحوث الانتاج الحيواني التابعة لقسم الإنتاج الحيواني بكلية الزراعة جامعة بنها- يهدف البحث الى دراسة تأثير طرق مختلفة للقلش على الكفاءة الإنتاجية وبعض الصفات الفسيولوجية في دجاج الهاي لاين. تم اختيار ٢٧٠ دجاجة هاي لاين عمر ٦٠ اسبوع بطريقة عشوائية من قطيع كبير متماثلة في الوزن.

تم تقسيم الطيور الى ثلاث مجاميع، حيث غذيت دجاجات المجموعة الأولى (٣٠ دجاجة) حتى الشبع واعتبرت كمجموعة قياسية للمقارنة و المجموعة الثانية (١٢٠ دجاجة) تم اجبارها على القلش باضافة ١% أكسيد زنك على العليقة المقدمة للطيور لمدة ١٤ يوم والمجموعة الثالثة تم اجبارها على القلش بتحديد كمية العليقة ب ٢٥% من العليقة المستهلكة للمجموعة القياسية لمدة ٧ أيام ثم التصويم لمدة ٧ أيام أخرى.

تم تقسيم طيور كلا المجموعتين الثانية والثالثة بعد القلش (بعد التوقف الكامل عن إنتاج البيض) الى أربعة تحت مجاميع تم حقنها كالآتي:

١- ماء مقطر ١مليلتر لمدة ٦ أيام واعتبرت مجموعة قياسية.

٢-استراديول ١٧ بيتا ١٠ ملليجرام/ملليلتر لمدة ٦ أيام.

٣- اندوميزازين (مثبط للبروستاجلاندين) ١٠ ملليجرام/ملليلتر لمدة ٣ أيام ثم بروموكربتين (مثبط للبرولاكتين) ١٠ ملليجرام/ملليلتر لمدة ٣ أيام.

٤-الهرمون المنشط للغدد الجنسية ٥٠ وحدة دولية لمدة ٦ أيام.

وجاءت النتائج كالتالي:

- أدت معاملات القلش الإجباري جميعها إلي نقص معنوي في وزن الجسم ، وحققت الدجاجات التي غذيت علي ١ % أكسيد زنك ثم حقنت بالاستراديول أعلي متوسط في وزن الجسم بعد القلش تلتها دجاجات المجموعة التي لم يحدث لها قلش إجباري ثم تلك التي تم قلشها عن طريق التصويم ثم حقنها بالاندوميزازين و ا لبروموكربتين.
- كانت دجاجات المجموعة التي اجبرت علي القلش بالتصويم ثم حقنت بالاستراديول هي الأقل في معدل استهلاك الغذاء في جميع مراحل التجربة كما حسنت الكفاءة الغذائية معنوياً عند مقارنتها بباقي المعاملات.
- تفوقت الدجاجات التي اجبرت علي القلش بالتغذية علي عليقة احتوت ١ % اكسيد زنك ثم حقنت بالهرمون المنشط للغدد الجنسية أو الاستراديول ١٧ بيتا في معدل إنتاج البيض.
- أدي التصويم كطريقة للقلش الإجباري ثم الحقن بالهرمون المنشط للغدد الجنسية إلي زيادة في وزن البيضة وكتلة البيض.
- أدي حقن الدجاجات التي أجبرت علي القلشبالتصويم أو بإضافة ١ % اكسيد زنك إلي الغذاء بالهرمون المنشط للغدد الجنسية إلي زيادة في هرمون الأستراديول في بلازما الدم عند الأسبوعين الرابع و الثامن علي الترتيب بعد القلش.
- حققت الدجاجات التي اجبرت علي القلش باضافة ١ % اكسيد الزنك إلي الغذاء ثم حقنت بالماء المقطر زيادة معنوية في مستوي هرمون البروجسترون في بلازما الدم.
- أدي التصويم كطريقة للقلش الإجباري إلي نقص معنوي في مستوي التراي ايودوثيرونين وزيادة مستوي هرمون الثيروكسين.

* من هذه الدراسة ، يمكن التوصية باستخدام التصويم كطريقة للقلش الإجباري و الحقن بالاستراديول أو الهرمون المنشط للغدد الجنسية علي الترتيب لتحسين الكفاءة الإنتاجية لدجاجات إنتاج البيض خلال الموسم الإنتاجي الثاني.